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Canadian Science Advisory Secretariat
Science Response 2016/002

Maritimes Region

WESTERN COMPONENT (4XOPQRS5) POLLOCK HARVEST CONTROL RULE UPDATE REPORT

Context

Pollock in NAFO Areas 4VWX5 comprise two population components: a slower-growing Eastern Component including Divisions 4V and 4W, as well as Unit Areas 4Xm and 4Xn, and a faster-growing Western Component (WC) including 4Xopqrs and Canadian portions of Area 5. The WC has been the main focus of past analytical assessments, but scientific advice on stock status and catch limits using Virtual Population Analysis (VPA) modeling has been highly variable, especially since the mid-2000s. For example, the 2008 assessment indicated that age 4+ population biomass was at 27,000 t (Stone et al. 2009) while the 2010 assessment update indicated 4+ population biomass was either 23,000 t or 17,000 t, depending on whether the very low 2010 DFO Research Vessel (RV) Survey indices were excluded or included from the analysis (Stone 2011). Consequently, the Canadian fishing industry recommended exploration of alternative approaches that would provide more stability in future catch limits to allow for better business planning and a more stable fishery.

In 2011, fisheries managers and the fishing industry decided to manage WC Pollock using a risk-management approach and embarked on a Management Strategy Evaluation (MSE) process, with the help of government scientists and outside experts (DFO 2011). MSE is a technique to explicitly consider the uncertainty in stock assessment assumptions and models, and to compare the likely consequences to Management Objectives when a predetermined Management Procedure (MP) incorporating a Harvest Control Rule (HCR) is applied. The Pollock MP was selected on the basis of satisfying three medium-term objectives agreed upon for management of the resource, which relate to sustainability, catch levels and the extent of annual catch changes. The MP model was built around a HCR that either increased or decreased future catch limits based on results from ongoing monitoring from the annual DFO Summer RV Survey. An Exceptional Circumstances Protocol was put in place to cover situations which fall outside the range for which the MP was simulation tested and, if necessary, to allow for some form of intervention.

Recently, Fisheries Management posed the following question to Science: What is the Western Component catch level for fishing year (FY) 2016-2017 generated by the Harvest Control Rule described in DFO 2011 "*Western Component Pollock Management Strategy Evaluation*"? This report provides an update to the 2014 report (DFO 2015) on the Western Component Pollock Harvest Control Rule and provides advice on the FY 2016-2017 catch limit generated by the Pollock MP and HCR using updated information from the 2015 Summer RV Survey. It also describes current status with respect to the provisions in the Exceptional Circumstances Protocol. The HCR with updated monitoring data for 2015 generated a catch limit of 2,225 mt for FY 2016-2017, down 20% from 2,781 mt for FY 2015-2016. The RV survey biomass index decreased from 8.53 kg/tow in 2014 to 4.55 kg/tow in 2015, but this decline did not trigger the exceptional circumstance provision of the RV Survey biomass index being < 6 kg/tow for two consecutive years and the Survey Index Ratio being < 0.2.

Canada

This Science Response Report results from the Science Response Process of December 2, 2015, on the Status Update of the Western Component Pollock Management Strategy Evaluation.

Analysis and Response

DFO Summer Survey Index

The DFO Summer Survey time series for the WC Pollock biomass index (kg/tow) extends from 1984-2015, a period when the same survey design and bottom trawl (Western IIA) have been used annually (Figure 1). The index is based on survey strata representing unit areas 4Xopqrs+5Yb and does not include 5Zc (eastern Georges Bank). The biomass index exhibits strong year-effects, which reflect the semi-pelagic schooling behavior of Pollock, and changes in availability arising from differing distributions in the water column at the times of the survey. In general, there has been a declining trend in the index since the late 1980s, an increasing trend from 2003-2007, followed by another decline to 2012. While the index increased in 2013, it declined again in 2014 and 2015. Although the index is highly variable, the long terms tends are important. The RV series using a 3-year geometric mean (GM) (three-year moving average) provides a better impression of long term trends by smoothing year effects and provides the monitoring data used in the HCR for calculating future catch limits (Figure 1).

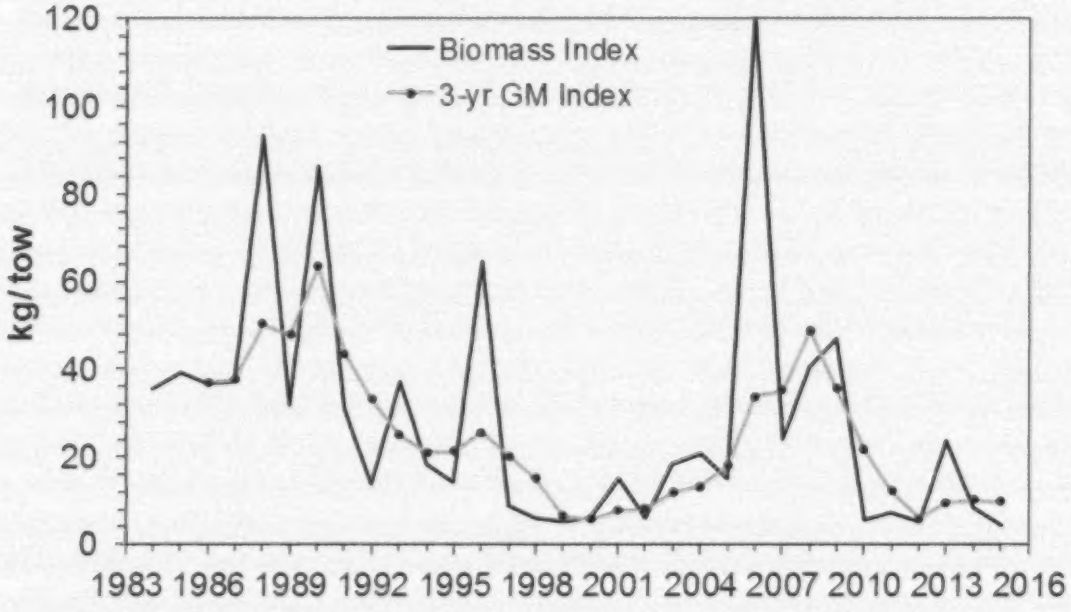

Figure 1. DFO Summer Research Vessel Survey biomass index and 3-year geometric mean (GM) index based on survey strata representing unit areas 4Xopqrs+5Yb, 1984-2015.

Harvest Control Rule

The Pollock MP is linked to the HCR to calculate catch limits based on results from ongoing monitoring (Summer RV Survey). The catch limit either increases or decreases by up to 20% annually (with increases capped at 500 mt) depending on the value of the GM biomass index for the most recent 3 years (i.e. 2013-2015) as a proportion of the GM of the index for 1984-1994, a period of high productivity (also referred to as the Survey Index Ratio). The catch limit was

initially set at 6,000 mt in 2011 for the Pollock MP Model and the maximum permitted decrease limit (20%) has been applied every year since 2011, except for FY 2015/2016. The survey biomass index decreased from 23.45 kg/tow in 2013 to 8.53 kg/tow in 2014 and further down to 4.55 kg/tow in 2015, the lowest value in the time series (1984-2015). However, because the index was high in 2013 (23.45 kg/tow), the 3-year GM value for 2013-2015 shows only a modest decrease to 9.69 kg/tow and the resultant Survey Index Ratio is now at 0.27. Based on this value, the HCR calculates a catch limit of 2,225 mt for FY 2016/2017, down the maximum permitted 20% from the 2015/2016 catch limit of 2,781 mt. In order for the FY 2016/2017 catch limit to have increased, the Summer Survey biomass index for WC Pollock in 2015 would have had to exceed 5.3 kg/tow.

Exceptional Circumstances Protocol

There are provisions to cover situations outside the range for which the Pollock MP model was simulation tested (or beyond situations that the management procedure was designed to handle). These provisions can be applied by decision-makers to amend the catch limits set by the Pollock MP or to revise the MP itself but should not be a frequent occurrence. They are based on unexpected results (up or down) from monitoring data (i.e. RV survey biomass index).

Results that would trigger an exceptional circumstance based on the protocol established in DFO 2011 include:

1. When the Survey Index Ratio falls below 0.2 or is beyond the 90% probability level from model predictions.

The current Survey Index Ratio (based on the 3-year GM survey index for 2013-2015 as a proportion of the index for 1984-1994) is 0.27, which is above the exceptional circumstance value of 0.2.

2. When the RV survey biomass index is < 6.0 kg/tow for two consecutive years.

The RV index was 4.55 kg/tow in 2015 and 8.53 kg/tow in 2014, which does not trigger an exceptional circumstance.

3. Additional situations.

RV survey age-specific indices are monitored for changes in age structure that could also trigger an exceptional circumstance (i.e. when extremely compressed/expanded). There has been a period of diminished numbers at age for older ages from 1995-2005, with some modest improvement since then (Figure 2). The recent age structure indicates that there are few fish in the population older than age 7.

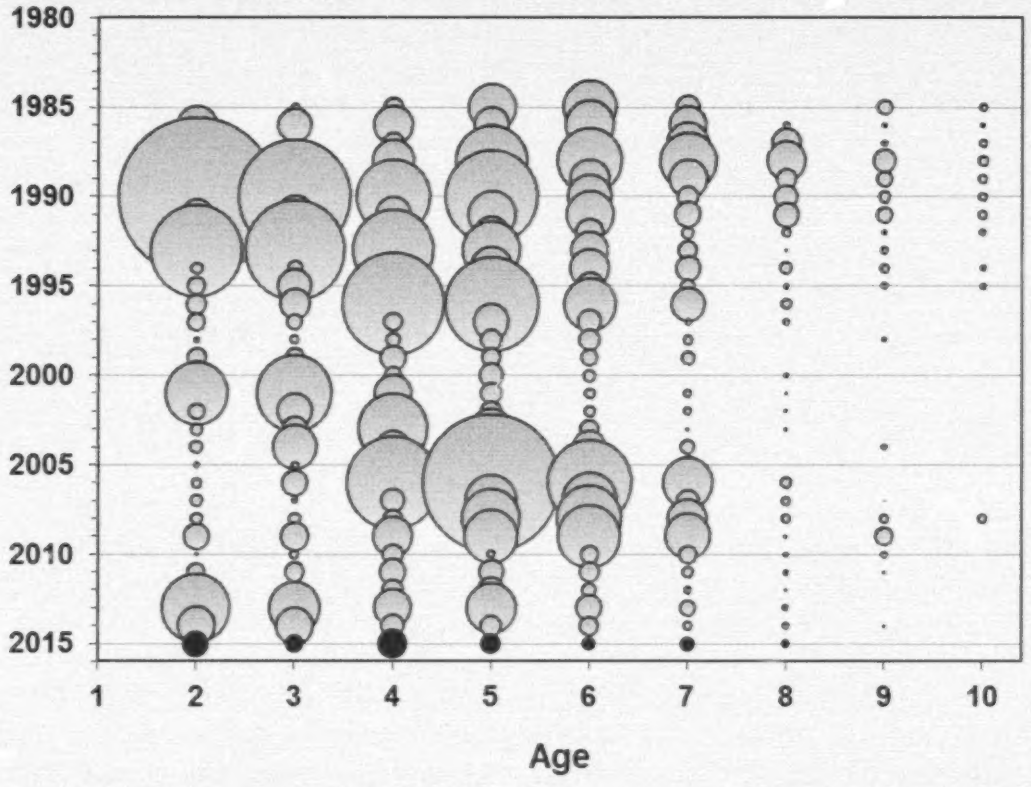

Figure 2. Stratified mean number per tow at age for Pollock from the DFO Summer Research Vessel Survey based on strata representing unit areas 4Xopqrs+5Yb for ages 2-10, 1985-2015. The index values for the 2015 survey are shown in black. (Bubble size is proportional to the stratified mean number per tow at age).

Conclusions

Using updated monitoring data, the HCR calculates a catch limit of 2,225 mt for WC Pollock for FY 2016-2017 down from the previous year. The survey biomass is at the lowest of the time series.

The Pollock MP and its HCR have responded to declining trends in the survey biomass index for WC Pollock by bringing the catch limits down over the past few years. Since its inclusion in 2011, no exceptional circumstance has been triggered and a review of the MP model has not been required. In 2016, there will be a review of the MP model.

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Sources of Information

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